

Investigating in PrimaryConnections

Investigating is one of the five underpinning principles of the PrimaryConnections programme. It is specifically contained in the definition of scientific literacy used by PrimaryConnections which includes the capacity to:

‘be able to identify questions, investigate and draw evidence based conclusions’.

Investigating is embedded in the PrimaryConnections 5Es teaching and learning model and is exemplified in the curriculum units from Early Stage 1 to Stage 3 and across all strands: Earth and Beyond, Life and Living, Energy and Change, and Natural and Processed Materials. Students’ investigating skills develop as they progress through primary school and this is reflected in the nature and increasing complexity of the investigations. The shift from teacher-guided to student-planned investigations correlates with the development of investigating skills.

Types of investigating

The type and complexity of the investigation is dependent on the phase, the stage level and the context of the curriculum unit.

Investigating at the ENGAGE and EXPLORE phases

The focus of the *Engage* phase is to engage students and elicit prior knowledge. The focus of the *Explore* phase is to provide hands-on experience of the phenomenon. Exploratory investigations are featured at the *Engage* and *Explore* phases.

Exploratory investigations: Students gain hands-on experiences of science phenomena which require them to make and record observations of objects and/or events. These investigations engage students with the phenomena, stimulate curiosity, raise questions and develop observation and representation skills. They lay the foundation for developing explanations of the science phenomena.

Investigating at the ELABORATE phase

The focus of the *Elaborate* phase is to extend understanding to a new context or make connections to additional concepts through a student-planned investigation.

At Early Stage 1 and Stage 1, students have structured experiences of investigating where the teacher leads them through the process step by step. By Stage 2 and Stage 3, as skills develop, students have increasing opportunities to plan and conduct an investigation within the context of the unit where the teacher’s role is that of a facilitator, guiding the process. Students have input into making decisions about choosing and writing questions for investigation, designing the investigation, collecting data, recording results, interpreting and representing results, drawing conclusions and communicating findings.

Investigating in PrimaryConnections

Four main types of investigation can be found at the *Elaborate* phase.

Fair test investigations: Students have experiences of a science phenomenon where factors or variables are changed, measured and kept the same. Explanations and conclusions are directly related to the changed variable.

Survey investigations: Students observe phenomena or carry out surveys, seek patterns in the results, represent and communicate their findings.

Design investigations: Students are given a problem or brief and are required to design, make and appraise an object or a system and communicate their results. These often feature a combination of science and technology.

Secondary data investigations: Students research, analyse, explain and represent secondary data (data collected by others) about phenomena.

PrimaryConnections investigation planners

PrimaryConnections uses two types of investigation planners which reflect the progression of skills from Early Stage 1 to Stage 3. Explicit instruction about investigating and using the planners is contained in the units:

- Investigation planner: Early Stage 1 and Stage 1
- Investigation planner: Stage 2 and Stage 3.

Additional teacher support is available in the Appendices:

- How to conduct a fair test
- How to write questions for investigation
- How to organise cooperative learning teams.

Skills of investigating

PrimaryConnections explicitly helps students develop the following skills.

Students:

- **Plan** the investigation and make predictions
- **Conduct** the investigation and record results
- **Interpret** the findings and **represent** results in an appropriate way
- **Evaluate** the investigation by developing explanations and drawing conclusions based on the evidence
- **Communicate** findings.

Investigating in PrimaryConnections

An elaboration of the skills of investigating

Planning

- Develop the question for investigation
- Identify variables
- Choose variables to change, measure and keep the same (in fair test investigations)
- Make predictions
- Plan the materials, equipment and steps.

Conducting

- Conduct the investigation activity
- Observe, measure and calculate
- Collect evidence
- Record and organise data.

Interpreting and representing

- Think about results and the question
- Look for patterns in the results
- Represent results in appropriate ways, such as: data tables, charts, graphs, diagrams.

Evaluating

- Develop explanations for the results based on evidence
- Analyse results in relation to the question
- Reflect on the investigating process and look for improvements.

Communicating

- Use appropriate representations for the findings of the investigation
- Present findings to an audience
- Talk about the evidence
- Explain the 'How we know' of the TWLH chart. Present the evidence which supports what has been learnt.

Investigating in PrimaryConnections

Exploratory investigations in PrimaryConnections curriculum units

Exploratory investigations occur at the *Engage* and *Explore* phases of PrimaryConnections curriculum units through all strands and stages. The table below shows examples of curriculum units and specific lessons which feature exploratory investigations.

| STAGE | Earth and Beyond | Life and Living | Energy and Change | Natural and Processed Materials |
|----------------------|---|---|---|---|
| EARLY STAGE 1 | <i>Weather in my world</i> Lesson 2 Session 3: Weather watchers | | <i>On the move</i> Lesson 3: Playground play | <i>What's it made of?</i> Lesson 2: Object observers |
| STAGE 1 | <i>Water works</i> Lesson 3: Rain, rain | <i>Schoolyard safari</i> Lesson 1 Session 2: In my schoolyard | <i>Push-pull</i> Lesson 4: What sinks? What floats? | |
| STAGE 2 | <i>Spinning in space</i> Lesson 3: Shadows at play | <i>Plants in action</i> Lesson 2: What's inside a seed? | | <i>Material world</i> Lesson 3: Leak, soak or repel? |
| STAGE 3 | | <i>Marvellous micro-organisms</i> Lesson 1 Session 1: Exploring bread | <i>It's electrifying</i> Lesson 1: What makes it go? | <i>Package it better</i> Lesson 2: Peering at packages |

(The italicised title is the unit and the non-italicised title is the specific lesson.)

Investigating in PrimaryConnections

Fair test, Survey, Design and Secondary data investigations in PrimaryConnections curriculum units

Fair test (FT), Survey (S), Design (D) and Secondary data (SD) investigations occur at the *Elaborate* phase of PrimaryConnections curriculum units. Teacher judgment about the level of support required for students as they conduct investigations is crucial. For example, following a guided investigation, a teacher might provide opportunities for students to plan and conduct their own investigation within the boundaries of the context of the topic. The table below shows examples of curriculum units and specific lessons which feature fair test, survey, design and secondary data investigations.

| STAGE | Earth and Beyond | Life and Living | Energy and Change | Natural and Processed Materials |
|----------------------|---|---|--|--|
| EARLY STAGE 1 | <i>Weather in my world</i> Lesson 6 Session 2: Using wind meters (FT) | | <i>On the move</i> Lesson 6 Session 2: Roll on (FT) | <i>What's it made of?</i> Lesson 5: Waterproof wonders (FT) |
| STAGE 1 | <i>Water works</i> Lesson 6: Investigating water use at home (S) | <i>Schoolyard safari</i> Lesson 6: Habitat detectives (S) | <i>Push-pull</i> Lesson 7: Helicopter test flights (FT) | |
| STAGE 2 | <i>Spinning in space</i> Lesson 5: Investigating shadows (FT) | <i>Plants in action</i> Lesson 7: Investigating conditions for plant growth (FT) | | <i>Material world</i> Lesson 6: Investigating insulation (FT) |
| STAGE 3 | <i>Earthquake explorers</i> Lesson 5: Earthquakes downunder (SD) | <i>Marvellous micro-organisms</i> Lesson 6 Session 2: Investigating mould (FT) | <i>It's electrifying</i> Lesson 6: Problem solvers: What's it all about? (FT) | <i>Package it better</i> Lesson 6: Daring designs (D) |

(The italicised title is the unit and the non-italicised title is the specific lesson.)

References

Dawson, Vaille., & Venville, Grady. (2007). *The art of teaching primary science*. Australia: Allen & Unwin.
 Feasey, Rosemary. (2006). Scientific investigation in the context of inquiry. In Wynne Harlen.(Ed), *ASE Guide to Primary Science Education* (Ch 18). UK: Association for Science Education.
 Harlen, Wynne. (2001). *Primary Science Taking the Plunge second edition*. USA: Heinemann.